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MISCELLANEOUS PUBLICATION 13

BIOLOGICAL LABORATORIES COMMUNICATION

George H. Nelson
Donald M. Hodge

DECEMBER 1965

UNITED STATES ARMY
BIOLOGICAL LABORATORIES
FORT DETRICK

U.S. ARMY BIOLOGICAL LABORATORIES
Fort Detrick, Frederick, Maryland

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DIRECTORATE OF TECHNICAL SERVICES

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ABSTRACT

The status of scientific communications was evaluated at the U.S. Army Biological Laboratories through a questionnaire. Two hundred twenty-five responses provided the source information. Evidence indicates a hazy understanding of good communications, a lack of familiarity with the means of good communications, and a lack of recognition of the close interrelationships among information, management, and operations. Generally speaking, participants recognized these characteristics but questioned their own involvement in an information system rather than in their individual interests (operations). The implied placement of responsibility was on information personnel. Several suggestions are made in regard to the future course of Biological Laboratories' information systems.

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I. INTRODUCTION

For a long time the information program at the U.S. Army Biological Laboratories developed on the basis of a real but undocumented need. Because information use, generation, and dissemination is a prime factor in a research and development institution, the existence, functioning, and growth of a direct-support information program demands a greater foundation. To strengthen its foundation and make the USABL information program more factual and knowledgeable, a questionnaire was devised and issued to 690 supervisors, scientists, and technicians. Two hundred twenty-five responses were received by October 1964; the results of those responses are documented in this report.

Because an information system is necessarily user-oriented, the questionnaire was designed to determine the technical information needs of scientists and engineers at these laboratories. The responses, in sum, helped to provide answers to some of the following questions:

1) Is there a need for an information system?

2) If there is a need, what is it?

3) What are the most expeditious means to satisfy that need?

4) Which of those means are available?

5) What must be provided to complete the requisite means?

6) Can the not-on-hand means be obtained?

7) Can the on-hand means be used immediately as the other requirements are being provided?

8) How much time is involved in using the means to operate the system?

9) Will the system be out-dated by the time it is in operation?

10) Can the envisioned system be updated as it is being developed without staying the progress of its development?

11) Are the users ready for or will they be ready to use the system?

II. PROCEDURES

The parent of the questionnaire used in this study was one devised by the Biological Sciences Communication Project (BSCP)* (Appendix A). Review of the BSCP questionnaire by local directorate, division, and branch offices indicated that it was appropriate to universities and possibly to industry, but not to the Biological Laboratories. Through review, criticism, suggestion, and helpful commentary, a two-part questionnaire was devised (Appendix B). The intent was to elicit responses from supervisory personnel as contrasted to nonsupervisory or scientist-technician personnel and, ultimately, to determine the needs of each user group.

After review and approval, the final questionnaire was reproduced and numbered. The requisite number of copies (plus extras for those individuals overlooked in the preliminary estimate) was given to the offices of four directorates chosen to participate in the study because their activities encompassed most research and development activities at these laboratories; not all persons considered to be scientific or technical were queried.

The management in each of the four directorates determined which personnel received the supervisory questionnaire and which received the scientist-technician questionnaire. This freedom was necessary because definitions varied - a scientist in one directorate might be considered a technician in another, or he might be considered a supervisor in one directorate but not in another.

The supervisory questionnaire was to reach those who lead others in research and development activities. The scientist-technician questionnaire was to be distributed to those actively engaged in research and development activities. Thus, a person engaged not only in supervision but also in active scientific endeavor might receive both kinds of questionnaires.

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* Formerly an adjunct [illegible] but now connected with George Washington University, Washington, D.C.

III. FACTORS AFFECTING RESPONSES

About half of the supervisors and 29% of the scientist-technicians filled out and returned the questionnaires. There are, no doubt, manifold reasons for this response. Some apparent reasons follow.

Once received, the choice of completing or not completing the questionnaire was entirely that of the respondent. No means was provided to identify respondents; no authority demanded that the questionnaire be completed; no deadline was set for completing the questionnaire, only that compilation of the results would begin on October 1. (Questionnaires were distributed to directorate offices about the first of July.)

Inquiries into the reasons for the relatively few responses indicated that reception of the questionnaire was very poor in two directorates; some supervisors failed to distribute questionnaires to their subordinates, so that they had no chance to participate. The questionnaire may have been too long; it had been reduced to what was thought to be a minimum size to provide useful information, but many respondents complained. Unfortunately, just before and during the response period for this questionnaire, several other questionnaires had been initiated.

Perhaps the most conclusive reasons can be summed up by one individual's note: "It seems that the Biological Laboratories is rapidly approaching the saturation point when it comes to the distribution of forms for completion. From my observations, the volume and frequency have reached the point where many contributors no longer take the requests seriously. At best, many of the responses will represent a half-hearted effort. The time and money expended on these programs are assuming very substantial proportions. In general, I am of the opinion that every individual who is doing his job properly is conducting the necessary communications thereto. If the employee cannot be relied upon to perform this phase of his work, he should be re-assigned to an appropriate position."

IV. RESULTS

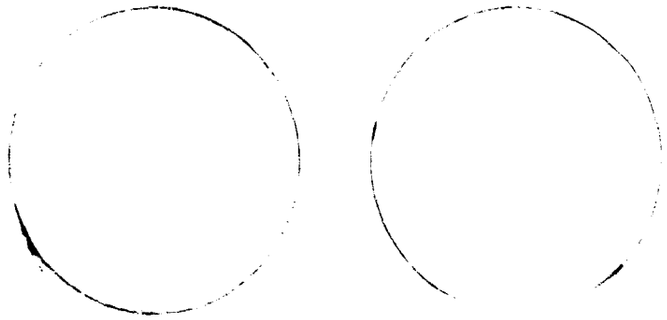
The total number of people in each of the directorates, the actual distribution of the questionnaires, and the responses to it are shown in Table 1. The distribution of the questionnaire was determined by a process of elimination resulting from various factors as explained below.

Ninety per cent of the responses were returned within 6 weeks after distribution. One Directorate did not return any undistributed questionnaires, as did the others. Thus, those who actually received the questionnaires may be fewer than the number shown here. For the other directorates the numbers shown are the numbers of questionnaires actually distributed.

The relatively poor response in two of the directorates casts question on the validity of reported results as representative of the over-all opinions in those directorates. Ideally, a major portion of the questionnaires should have been answered to support firm conclusions regarding a user-oriented system.

The following quotation from a committee report[1]* helps to explain our concern about requests for information and responses thereto, since information is so interrelated with USABL endeavors.

"Any organized endeavor may be categorized into three interacting spheres of management. These are PROGRAMS, OPERATIONS, and INFORMATION. PROGRAMS are detailed plans of what is to be accomplished. OPERATIONS embrace such functions as personnel, facilities, materials, funding, and equipment. INFORMATION is the communication of facts, figures, knowledge, instructions, and ideas relative to the accomplishment of the program. Let us now examine two of these spheres.



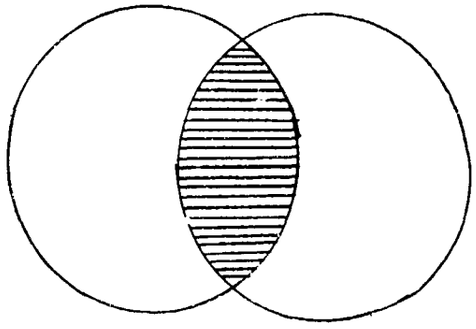
* Numbers refer to Literature Cited, p. 81. Additional references are listed on p. 82

TABLE 1. RESPONSES TO COMMUNICATIONS QUESTIONNAIRE

Directorate	Total[a] Personnel	Scientist-Technician			Supervisor		
		Actual[b] Distribution	Number Responding	Per Cent Responding	Actual[b] Distribution	Number Responding	Per Cent Responding
Medical Research	150	83	29	35	24	13	54
Biological Research	475	244	82	34	37	22	60
Development	288	130	23	18	35	11	31
Technical Services	332	104	27	26	33	18	55
Totals	1245	561	161	29	129	64	50

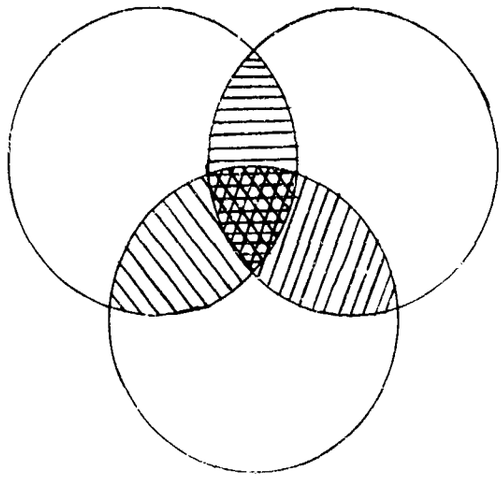
a. 31 October 1964.
b. Undistributed questionnaires not returned from one directorate.

"Within each of these spheres, information is generated. When the spheres are isolated, the information generated in each is oriented inward (producer-oriented). Those in the other sphere can only speculate about that information. However, if we blend these two spheres we get an area of overlap or interaction.



In this area speculation becomes an intuitive or inferential type of information - a plus value resulting from a working partnership.

"Now, let us blend in the third sphere, INFORMATION, and we find that we have created a three-way area of overlap, which is the vital factor by which more enlightened decisions can be made. It is only when all facets are blended that management can make sound decisions."



It is this overlap that makes it difficult for one area to speak of its own activities without also mentioning those of the other areas. There is a natural commonality that, in the overlap area, requires the consideration of the other two.

For the purpose of completing the questionnaires, anyone participating in an effort of a technical nature leading to reportable results was considered to be a scientist, engineer, or technician and eligible to respond to the scientist-technician questionnaire.

However, the designation "scientist-technician" seems to have caused a problem in that it failed to include "engineer" and therefore many apparently did not answer the questionnaire on that basis. Some of the questions were not designed for engineers but the majority fell within the answerable category. A partially answered questionnaire would have been of value in helping delimit the areas of knowledge possessed by "engineers" as contrasted to "scientist-technicians."

Broad dissemination of the questionnaire was encouraged so that anyone requiring information or issuing information as a product of his efforts was included. Some directorates, however, limited the interpretation of these words and consequently restricted the uniform dissemination of the questionnaire.

The pages that follow show the tabulated results of each of the questions. The question, quoted or paraphrased, is presented first and is usually followed by the results and comments. (The actual questionnaires are reproduced in Appendix B.) The questions are grouped to answer broader questions, as indicated in the following tabulation.

	Question Numbers (inclusive)	
	Scientist-Technician	Supervisor
A) What population sample was involved?	1-3, 5	
B) What knowledge do the respondents possess as to the procedures (enabling mechanisms) in formal acquisition?	6-11, 25-31, 35	6-8
C) What knowledge about communications do the respondents possess aside from knowledge of formal acquisition means?	4, 12-24, 32-34, 36-42	1-5, 10
D) Do the respondents have a knowledge or awareness of the organization and functioning of the information process?	43-49	
E) Do the respondents have suggestions and recommendations indicative of needs in the information field?	50, 51	9, 11, 12

A. WHAT POPULATION SAMPLE WAS INVOLVED? (Scientist-Technician Questions 1-3, 5).

Question 1: Highest earned academic degree?

Table 2 shows the highest degrees held by those who responded; there were approximately 80 multiple-degree holders.

TABLE 2. HIGHEST EARNED ACADEMIC DEGREE

Degree	Directorate of Medical Research	Directorate of Biological Research	Directorate of Development	Directorate of Tech. Services	Total
None	1	7	9	14	31
Bachelor	13	26	9	7	55
Master	6	21	1	2	30
Ph. D.	7	26	3	2	38
D. Sc.	-	-	1	-	1
DVM	2	2	-	1	5
Ambiguous Answer	-	-	-	1	1
Totals	29	82	23	27	161

We found in compiling the results of these questionnaires that several individuals without formal training exhibited in their replies a great perception of what is involved in good communication in an R&D institution. Apparently, the lack of a degree does not deny to a person the sensitivity needed to understand good communications, nor does a degree of necessity grant to individuals the understanding of or insight into the functionings of a good communications system.

The following tabulation shows the number of different institutions granting the highest degree for any one person. The educational background (institutional affiliation) of the respondents covers a broad spectrum. Of the 77 educational institutions represented, 60 are located east of the Mississippi River; the remainder are to the west; none is from Alaska or Hawaii.

Number of Different Institutions Represented	Number of Degree-Holders from Each Institution
51	1
12	2
9	3
3	4
2	5
Total 77	

Question 2: How long have you been employed at the Biological Laboratories?

The results of Question 2 are summarized in Figure 1. Characteristic of the distribution is the break in the number of people remaining at the installation after ten years' service. This pattern is verified in a study of the image of federal employees,[2] in which it was noted that those not motivated to stay in federal service left before the 10th year.

The brief length of service prompted some respondents to discount what they had to say about communications. This was not expected and may indicate that an indoctrination and orientation period is required in communications before persons newly arrived feel adequately informed about the means of communications at these laboratories. Basically, there is little difference between communications at the Biological Laboratories and at a university, a corporation, or any other R&D organization. If, however, new members feel unqualified to respond to this type of questionnaire, it probably indicates the need for additional training in this area.

Question 3: Indicate your present fields of specialization.

In answering Question 3, most respondents selected more than one field of specialization from the list provided. Some disciplines were not selected and were deleted from the final tabulation shown in Table 3.

Some responses to Question 3 indicate that we have not regarded the group represented by "technician" and similar designations as idea-generating. It might be well to bring this human resource into team-participation status.

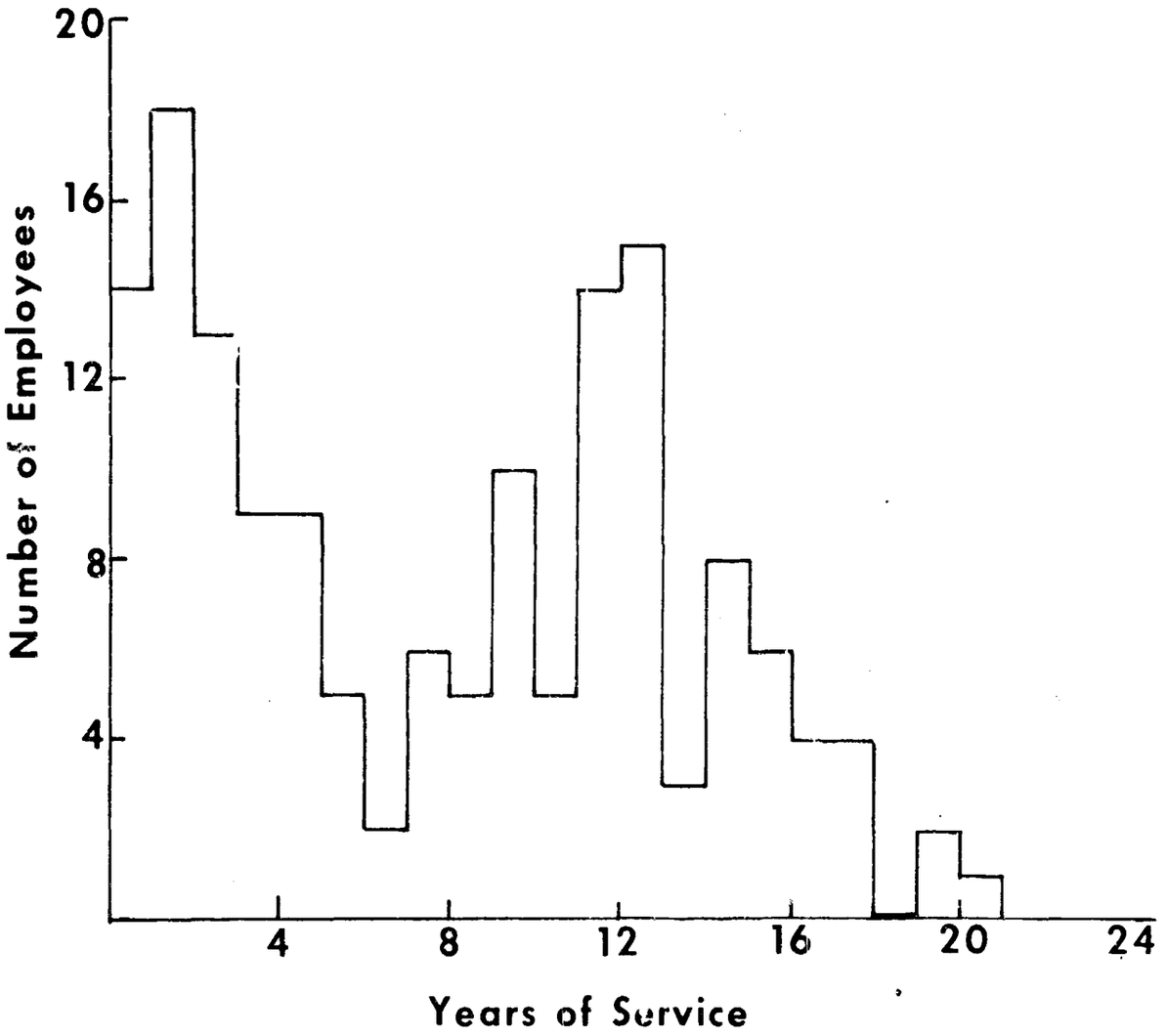


Figure 1. Responses of 153 Persons to Question 2, "How Long Have You Been Employed at the Biological Laboratories?"

TABLE 3. FIELDS OF SPECIALIZATION

Specialization[a]	Medical Research	Biological Research	Development	Technical Services	Total
Aerobiology	2	14	1	8	25
Agric. & Food Chem.	-	3	-	-	3
Agronomy	-	2	-	-	2
Animal Husbandry	-	-	-	1	1
Bacteriology	13	31	4	10	58
Biochemistry	8	21	2	-	31
Bio-Engineering	1	-	4	-	5
Biophysics	1	4	-	-	5
Botany[b]	-	8	-	-	8
Cloud Studies	1	2	2	2	7
Crops	-	2	-	1	3
Cryobiology	-	1	1	-	2
Engineering	2	-	10	1	13
Entomology	-	10	-	-	10
Epidemiology	-	2	1	-	3
Genetics	-	11	-	-	11
Immunobiology[c]	8	13	1	2	24
Information Sciences[d]	-	-	-	4	4
Materials Deterioration	-	-	2	-	2
Mathematics	1	-	1	9	11
Meteorology	1	-	1	-	2
Nutrition	-	4	-	1	5
Pathology	2	2	1	5	10
Pharmacology	-	-	1	-	1
Physics	-	1	1	-	2
Physiology	-	2	1	-	3
Phytopathology	-	1	-	-	1
Safety	-	-	-	2	2
Statistics	1	-	1	6	8
Taxonomy	-	1	-	1	2
Testing	2	2	5	7	16
Veterinary Medicine[e]	3	3	-	1	7
Virology	5	24	1	7	37
Zoology	-	1	-	1	2
Other					
Aeronautical Engrn.	-	-	1	-	1
Chemistry[f]	2	3	-	-	5
Computer Programing	-	-	-	4	4
Decontamination	1	-	-	-	1
Design & Testing	-	-	1	-	1
Instrumentation	1	1	-	-	1
Management	-	-	-	1	1
Medical Mycology	-	-	2	-	2
Microbiology	1	-	3	-	4
Radiobiology	1	-	-	-	1
Rickettsiology	-	1	-	-	1
Technician	-	-	3	-	3
Tissue Culture	-	1	-	-	1

a. Not selected: Anatomy, Ecology, Gnotobiology, Medicine, Psychology, Soil Science.
b. Includes Horticulture, Plant Physiology.
c. Includes Vaccines, Immunity.
d. Includes Technical Writing.
e. Includes Veterinary Surgery.
f. Includes Analytical, Organic, Physical, and Surface Chemistry.

Question 5: Select three activities that take up most, second most, and third most of your time.

Table 4 shows that about 80% of the 161 respondents place prime emphasis on research. The second choice (about 40%) was writing reports, and the third choice was using information sources. The data from Question 5 indicate further that there are some who do research without reference work (74 respondents) and some who do research without reporting (50 respondents). Perhaps some of these tasks are accomplished by associates who failed to answer or were not included in the survey. The creative research process is by nature a continuous one and depends heavily on revitalization by absorbing new ideas (using information sources) and on reconsideration of findings (reporting).

TABLE 4. ACTIVITIES REQUIRING MOST WORKING TIME

Activity	Most Time-Consuming	Second Most Time-Consuming	Third Most Time-Consuming
Research (Individual or Group)	126	5	3
Teaching	0		
Consulting	4		
Presenting R&D Results in Briefings, Staff Meetings, etc.	0		
Liaison with Contractors & Other R&D Establishments	1		
Writing Reports	6	62	40
Using Information Sources	2	31	48
Training	0		
Other (Please Specify)[a/]	22		

a. Respondents included under "other" such activities as management, computer programming, technician work, calculations, processing data, planning and scheduling, development and design, maintenance, and model construction. Also included under "other" were a few ambiguous answers, and three recipients did not answer this question.

In summary to this section, "What population sample was involved?", those who held no degree and those with Bachelor, Master, or Ph. D. degrees were relatively evenly represented. A large number of educational institutions and scientific disciplines were represented.

Research is the prime time-consumer, writing reports is second, and using information sources is third.

The absence of a complete creative cycle in the activities of respondents is strongly indicated.

B. WHAT KNOWLEDGE DO THE RESPONDENTS POSSESS AS TO THE PROCEDURES (ENABLING MECHANISMS) IN FORMAL INFORMATION ACQUISITION?
(Scientist-Technician Questions 6-11, 25-31, 35)
(Supervisor Questions 6-8)

1. Scientist-Technician Questions

Questions 6 through 11 elicited responses that were indicative of the respondent's reference habits. The responses indicate that the limiting factor in using information sources is not the absence of services provided, but the attitudes and practices of the user. He may use sources that are inadequate; he may use relatively static methods that have been superseded by functioning systems; he may limit the scope and depth of the introduction of new ideas. These findings are further verified by the answers to Supervisory Questionnaire Question 8. The need for preliminary screening of references and elimination of the chaff is indicated.

The responses to Question 6 are shown in the following tabulation and concern the frequency of use of the Biological Laboratories' Technical Library.

Frequency	Respondents
Once/Week	74
Once/Month	35
Twice/Month	1
Rarely	27
Daily	17
Never	22
Other	4
No answer	2

In the following tabulation, the answers to Question 7 (What other technical libraries do you use?) do not indicate a dedication to one source of information.

Type of Technical Library	Respondents
None (other than BioLabs)	74
BioLabs Inter-Library Services	19
BioLabs Division or Branch Libraries	8
Off-Post[a]	34
Other than any Technical Library[b]	8

a. Some respondents identified "Inter-Library Services" as "Off-Post."
b. Personal library, Frederick Community College Library, C. Burr Artz Library, Post Library.

Responses to Question 8 (Which Technical Library do you use most frequently?) are shown in the next tabulation.

Library	Respondents
BioLabs Technical Library	82
No Answer	38
Division or Branch Library	23
None	6
Ambiguous Answer	2
Post Library	4
Personal	2

Responses to Questions 9 through 11 (Table 5) indicate that the user would like to have his references and information sources brought to him (not exclusively or to the elimination of the freedom to browse), preferably in his office or work area. The replies to these questions do not, however, indicate a lapse in service provided by the BioLabs Technical Library.

TABLE 5. RESPONSES TO QUESTIONS CONCERNING LIBRARY SERVICES

Services	Yes	No	No Answer
Question 9: Are you aware that the Biological Laboratories' Technical Library offers the following services?			
Information & References	148	10	3
Inter-Library Loans	148	7	6
Duplicating	140	14	7
Translations	140	15	6
Bibliographies	144	23	4
Routing Appropriate References	108	43	10
Question 10: Are there services that you would like to have that the BioLabs Technical Library does not offer?	18[a]	125	18
Question 11: Is there any unique or special service offered by any of the other technical libraries that you use that you would find especially useful in the BioLabs Technical Library?	6[b]	134	21

a. Suggestions included routing of pertinent articles; a comfortable place to relax, read, and study; air-conditioning; information retrieval; broader coverage; and better translation service.

b. Suggestions included some items from Question 10 and the following: larger variety of specialized journals, especially engineering journals; routing of pertinent references; reprint ordering service, not just available blank post cards; renewals by telephone; emphasis on new books; self-service Xerox.

Question 25: List the number of professional, scientific, and technical journals to which you regularly refer.

No. of Journals	Respondents
No Answer	12
None	10
1	10
2	11
3	18
4	18
5	16
6-10	42
11-20	22
21-30	2

Question 26: List any other scientific publications significant to you or your work that you read or scan.

Other Publications	Respondents
No Answer	44
None	15
1	23
2	24
3	16
4	9
5	9
6-10	12
11-20	1
Numerous	4
Other Answers[a/]	4

a. Library deficient in medical mycology journals; keep all new books in library; Fort Detrick Technical Bulletins.

Question 27: List new journals that have been started in your field in the last twelve months.

No. of New Journals	Respondents
No Answer	109
Don't Know	12
None	27
1	11
2	1
3	1

Actually, approximately 120 new journals were started within the year preceding the questionnaire. Nearly 75% of the respondents had no answer or did not know of the new journals in their fields, which indicates a deficiency in the close-up working knowledge of new developments in publications.

Questions 28 and 29 were concerned with the frequency of use of Biological Abstracts and the use of other abstracting publications, respectively. The responses to these questions (Table 6) indicate that (i) the users are not aware of the usefulness of abstracting publications as keys to the scientific literature, or (ii) users are content to remain limited to the small number of journals that any one individual can digest and still maintain an active, meaningful, nonrepetitive experimental program.

TABLE 6. FREQUENCY OF USE OF ABSTRACT PUBLICATIONS

Frequency	Biological Abstracts	Other Abstracts[a]
No Answer	19	57
Never	30	0
Rarely	7	8
As Necessary	4	20
Once a Year	13	4
Twice a Year	17	10
Once/4 Months	7	4
Once/3 Months	5	6
Once/2 Months	11	11
Once/Month	23	25
Once/2 Weeks	15	11
Once/Week	7	5
Twice/Week	1	0
Constantly	1	0

a. Chemical Abstracts and Index Medicus were most popular. An additional 26 publications were cited, each by three or less persons.

In response to Question 30 (Do you use Current Contents?), 61 answered yes, 87 no, and 13 gave no answer. To Question 31 (Do you use any other bibliographic services?), 47 answered yes, 96 no, and 18 gave no answer.

Question 35: Are you on anyone else's mailing list to receive copies of any work done? If yes, from how many persons have you requested such courtesy?

On Mailing List	Respondents
No Answer	9
No	127
Yes	24
How Many?	
1	3
2	5
3	3
4	4
5	4
8	1
10	2
Don't know	1
Contractors	1

These results indicate that the inward flow of information to individuals is very poor, and therefore the possible cross-fertilization of ideas is low. Perhaps one of the hindrances to good inward flow is the amount of effort required on the part of individuals to get the information in. This observation is not limited to published materials but also to answers to specific queries. There also seems to be a feeling of restriction in the dissemination of information from these laboratories, as indicated in the responses to Question 36 (Section IV, C).

2. Supervisor Questions

Question 6 (Do you encourage the use of the BioLabs Technical Library?). Only 2 of the 64 responding supervisors replied no. Several answers to earlier questions (practice) vary from the answers to this question (policy).

The respondents were given a choice of answers to Question 7 (How do you prefer to select your reference sources?).

Selection of References	Respondents
No Answer	1
Bibliography with descriptor words	14
Bibliography with abstracts	24
Bibliography with both	34
Bibliography with neither	0
Browsing	25
Word of mouth (includes journal club)	21

Question 8: How do you prefer to do your reference work?

Means of Doing Reference Work	Respondents
No answer	1
No reference work done	1
In Technical Library	28
In office with bibliography and abstract sources	33
In office with verbatim copy	38
At home	16
Listening to lectures	13

It is apparent that available abstract or bibliographic services are not used. Experience indicates that it is nearly impossible to cover pertinent journals and still continue active experimentation simultaneously. One would think that the next best approach would be that of using the sources containing abbreviated versions of the larger journal articles. The supervisors' replies show, however, that "in office with verbatim copy" is preferred over any other type of reference search. One might deduce that the adherence to this tedious method of acquiring specific bits of information is the crux of the problem of utilizing the flood of scientific information. And this, in turn, may point the way to a more satisfactory information system.

3. Summary (What Knowledge do the Respondents Possess as to the Procedures, or Enabling Mechanisms, in Formal Information Acquisition?)

The limiting factor in the use of information sources seems to be the attitude and practices of the user.

The need for preliminary screening of references and elimination of chaff is indicated.

The user would like to have his references and information sources brought to him (not exclusively or to the elimination of the freedom to browse), preferably in his office or work area.

Unique or special services suggested are variations of those already in existence, and are worth consideration for incorporation into the information systems design.

Considerable time is expended in consulting the technical literature. The user cannot keep up with the expanding volume of scientific references, and generally is not even able to use abstracting services.

The direct but after-the-fact system of sending for reprints or having reprints sent to the user is not used significantly.

C. WHAT KNOWLEDGE ABOUT COMMUNICATIONS DO THE RESPONDENTS POSSESS ASIDE FROM KNOWLEDGE OF FORMAL ACQUISITION MEANS? (Scientist-Technician Questions 4, 12-24, 32-34, 36-42; Supervisor Questions 1-5, 10)

1. Scientist-Technician Questions

The answers to Question 4 (How many other scientists at USABL are interested in this specialty?), when matched against the answers to Question 3 (Section IV, A), indicate a certainty in each person of his own specialty but a marked unawareness of others with similar specialties: about 60% of the respondents to Question 4 indicated that they did not know which other BioLabs personnel were interested in their specialties. Thus, a need for knowledge about others within the installation who are interested in the specialty is indicated, as well as the fact that apparently no mechanism is available here for this purpose. Answers to other questions in this section indicate that we are cultivating exchanges with others outside our laboratories, but not sufficiently with those within our immediate sphere of activity.

Question 12 concerned the working relationships between laboratory scientists. Of the 161 respondents, 128 indicated that they worked as a member of a team. Ten said that there were 12 to 100 members on the team; the remaining 118 team members indicated that there were 2 to 10 members on the team. According to the questionnaire, most teams comprise three members. About 70% of the team members are supposed to route scientific information throughout the group.

Question 13: How often do outside consultants come to your division to give lectures or do research? Nearly half of the respondents gave negative replies (don't know, never, no answer). Affirmative answers ranged from "twice a week" to "very often," through "occasionally," "infrequently," and "once a year."

Similar answers were given to Question 14 (How often do visiting scientists come to your division to give lectures or do research?). About 40% gave negative answers, and the affirmative answers were quite similar to those given in the previous question.

The next six questions were concerned with society membership and attendance and participation in conferences and symposia. The answers to those queries are shown in the tabulations that follow.

Question 15: Of what scientific or professional societies are you a member?

No. of Societies	Respondents
No Answer	7
None	43
1	29
2	31
3	24
4	18
5	6
6	3

Question 16: What scientific or technical meetings did you attend within the last 12 months? The tabulated results are shown below.

Meetings	Respondents
No Answer	7
None	42
1	56
2	41
3	12
4	1
5	1
15	1

Question 17: Did you obtain any significant scientific information at any of these meetings? If yes, where did you learn it?

Information Obtained from Meetings	Respondents
No Answer	26
No	22
Yes	113
Paper-Reading Session	88
Exhibit (including demonstration)	37
Symposium	65
Motion Picture or TV	14
Informal Discussion	73

These data show that about 90% of those who attended scientific meetings gained significant scientific information from them. The 113 people who gained information did so by a variety of means.

"No problem so plagues the directory of a laboratory as that of travel to other laboratories or to scientific meetings. This is particularly true if foreign travel is involved. And yet there is no other method of informal communication as effective as visiting other laboratories or attending conferences and meeting other scientists."[3]

Question 18: Have you given any papers or presented any address s at symposia or the like within the last year?

Presentations	Respondents
No Answer	5
No	129
Yes	27

Question 19: Do you participate in any intra- or inter-division discussion groups?

Participation	Respondents
No Answer	6
No	50
Yes	105

"On the basis of a 50% participation criterion it seems that participation in group discussion is a custom in the scientific community; for example, in the median laboratory 60% of the scientists did participate in such groups."[3]

Question 20: Are you reluctant to discuss your own new research plans with extra-division Biological Laboratories persons?

Reluctance to Discuss	Respondents
"No Plans"	1
No Answer	9
No	115
Yes[a/]	36

a. Parenthetical additions: "No one wants to listen," "If they have a need-to-know."

Marcson[3] quotes a scientist in an industrial laboratory who expressed the feeling of many scientists indicated in our answers to this question. "Often it is a very great help to be able to discuss your problem with people who are working in the same or similar areas. These people understand even when not working on your problem. We have valuable get-togethers over lunch. These discussions tend to give you insights. If not for these talks your thoughts become too channelized. Sometimes these talks give you insight into a back-door method of tackling your problem."

Others have similar feelings that "it is helpful to have at least one close colleague with whom the scientist can air his problems and get a sympathetic hearing. But one or two such individuals are enough. To provide the stimulation of new ideas, it is important that the remaining contacts be with people of dissimilar orientation. ...scientific performance tends to be higher if the scientist's chief and (his) major colleague are heterogeneous in scientific field -- one similar and the other dissimilar."[3]

Question 21: Is there anyone within the Biological Laboratories to whom you ordinarily refer scientific information or data? If yes, how many persons.

Refer Information to Persons	Respondents
No Answer	8
Don't Know	1
No	34
Yes	118
How Many?	
No Answer	6
1	11
2	23
3	9
4	22
5	13
6	9
7	4
10-20	20
39	1

Replies to the second part of Question 21 varied from 1 to 39. This type of communication pattern is good - one individual indicated the functioning of a journal club. One can, however, begin to question the higher numbers in the sense of how much of R&D resources is expended in an attempt to provide the enabling mechanism of information handling. Is this attempt one that is well-meaning but overlooks the existing enabling mechanism in organizations designed for information handling? Or is the existing enabling mechanism inadequate or ineffective? It might be well for scientists and managers to focus on an evaluation of information handling within their spheres of influence, and for those whose prime responsibility is information handling to review their systems and how well they are functioning in relation to the user.

The converse of referring scientific information to others, that of receiving information, was shown in Question 22. Of 161 respondents, 130 did receive information, 24 did not, and 7 failed to answer.

Question 23 asked if anyone outside the Biological Laboratories ordinarily referred information to the respondent. Seven gave no answer, 110 answered no, and 44 do receive information from outside sources.

In Question 24 respondents were asked to list the information routes that are of the greatest scientific benefit to them, and the nature of their contact with persons in those fields. The number of answers indicated in the following tabulation is high because several fields of interest were indicated by each of many respondents.

Greatest Benefit	Respondents
None	4
No Answer	36
Literature	235
Telephone	70
Mail	100
Technical Meeting	186
Personal Visits	161

Reference to the published literature, as expected, was indicated as the most frequent contact with other persons in the field.

Question 32 inquired as to the number and kind of publications the respondents had produced, and Question 33 asked how many had been produced in the past 5 years. The results are shown in the following tabulation. As evidenced by the responses to Question 33, approximately 70% of the publications had been completed within the last 5 years.

There seemed to be some question as to the interpretation of "BioLabs Official Report." Many individuals mentioned division quarterly, semiannual, etc. reports, although these are not recognized formal reports as defined in the guidance[4] on the publication of R&D results. Because of their limited scope these reports are not published and distributed as are the USABL Technical Reports, Technical Manuscripts, etc. Dependence on these division documents limits communication between originator and user, and reveals a restricted view of the need for reports on results.

Publications	Respondents
No Answer	21
None	21
No. of Journal Articles	
1-5	51
6-15	20
16-30	8
Check-Marked	3
Books	2
Chapters in Books	7
No. of BioLabs Official Reports	
1	7
2	15
3	13
4	2
5	3
6-10	12
11-15	3
35+	3
Many	4
Check-Marked	14
Several	1
Others[a]	14

a. Monographs, encyclopedia sections, patents, other agency technical reports, company technical reports.

Question 34: Are you a member of any reprint or preprint exchange group? Only 6 of 161 respondents answered yes, and 11 failed to answer.

Question 36: Do you have copies of your work sent to a regular mailing list? Five answered yes, 146 said no, and 10 failed to answer. Most of those who answered obviously do not know that their information is quite widely disseminated, and probably further do not know that they can send their reports to others with a need-to-know. How many individuals know the boundaries that are set on dissemination of information? How many know the varied types of information released to individuals by information personnel? It seems that security considerations have been so omnipresent that they tend to restrict information transfer. Perhaps this effect is self-imposed by scientists unnecessarily. It is time to institute an educational program to inform adequately the local sources of information on what can as well as what cannot be done in acquiring and disseminating information.

The next seven questions were concerned directly with research and the communications related to it. Question 37 asked "About how much of your research has not been published in journal form?" In this instance, we believe that the question was not read properly and accurately by the respondents. The results were subject to doubt; the use of N/A (not applicable) occurred so frequently that it was considered equivalent to "no answer."

Question 38: Think about the LAST research you completed and did not publish. Indicate the reasons.

Reasons	Respondents
No Answer	39
Inconclusive Results	50
Lack of Time	25
Prior Publication	1
Change of Program	26
Other[a]	38

a. Under Other appeared the following: security (21); in process (6); changed jobs (3); none or unspecified (4); long clearance process (2); work for other branch or division (1); filling this in (1).

Apparently "did not publish" meant to many "did not publish in journals." Many seem to place a high value on journal publication because they believe promotion, salary, professional recognition, etc. depend on such publication. This is unfortunate. A well-written formal government report can be a meaningful contribution, and can receive very wide announcement and distribution, even exceeding that of certain journals. Surely those who listed security as a reason for not publishing should realize that security considerations do not restrict their publishing formal government reports.

Question 39: Are you currently engaged in research? One hundred thirty-nine gave affirmative answers (in agreement with replies to question 5, Section IV, A), and 16 gave negative answers. The sources of ideas for the research are detailed in Question 40: Where did you get the idea for this research?

Source of Ideas	Respondents
No Answer	7
Informal Discussion	40
Mixture of Formal and Informal Discussion	61
Literature	39
Cannot Recall	1
Directed	92
Original (own) ideas	6

These data show that discussion with others is the most important source of new ideas. It is difficult to determine how much of the "directed" research would have been self-initiated if the work had not been ordered.

Question 41: Is your project a group effort? The answers agree well with those of question 12, which asked if the scientist were a member of a team. Of 136 who answered this question, 96 said the project was a group effort, 40 said it was not.

Question 42: "With whom do you discuss this research most frequently?"

Discussions With	Respondents
No Answer	22
Division Chief	7
Branch Chief	46
Section Chief	6
Supervisor (principal investigator)	43
Scientists (same discipline)	41
Co-workers	12
Technicians	2
No One	3

2. Supervisor Questions

Question 1 asked the supervisor if he held regular staff meetings and if so how often.

Staff Meeting	Respondents
No Answer	2
No	24
Yes	38
How Often?	
Daily	1[a]
Weekly	17
Twice a Month	2
Monthly	18
Quarterly	1

a. Informal gathering first thing in workday.

Question 2: What is your policy about attending scientific meetings?

Policy	Respondents
No Answer	4
Don't Know	1
I avoid them as being boring & poorly presented	1
Encourage	58[a]

a. With one or more of the following addenda: Subject to funds, workload, or division policy; authors attend; limited to section chiefs; once or twice per year.

In all of the responses, with one or two exceptions, was the idea of rotation to afford every eligible person an equal opportunity to go to meetings.

Question 3: Is a visiting lecturer program active in your division?

Lecturer	Respondents
No Answer	30
No	21
Yes	13

According to the responses to the scientist-technician questions 13-17 and 24, personal visits are an important source of information. The responses to supervisor question 3, however, do not seem to support this means of communication. Can we assume that we are able to gain all our new information from conventions and journals or other printed media?

Responses to Question 4 (How often do you have intra- or inter-division meetings?) are shown in Table 7.

TABLE 7. FREQUENCY OF DIVISION MEETINGS

	Intra-Division	Inter-Division
No Answer	12	32
None	1	2
Weekly	7	3
Twice a Month	3	-
Monthly	36	15
Quarterly	1	6
Semiannually	2	1
Irregularly	1	4
As Required	1	1

Question 5: Do you have any formal mechanism for exchanging scientific information with other supervisors?

Exchange Mechanism	Respondents
No Answer	1
No	31[a/]
Yes	32

a. Includes one reply checked "yes" but indicated "informal."

All 64 supervisory respondents gave affirmative answers to Question 10, which asked if they exchanged technical information with subordinates.

3. Summary (What Knowledge About Communications do the Respondents Possess Aside from Knowledge of Formal Acquisition Means?)

Research and development at the Biological Laboratories is carried out on a team basis. However, there is uncertainty as to the role of communication of information within and among teams. Cross-referral of information is prominent (73%).

Introduction of outside talent by visits, lectures, and the like seems weak - at least in the minds of the majority of respondents. Communication through the formal and informal mechanisms of society membership is not as well recognized as it might be. Oddly, many who are not society members attend scientific meetings. Ninety per cent of those who attended scientific meetings gained significant scientific information there by a variety of means.

The role of the individual in contributing to scientific information may be recognized, but actual contributions to the fund of knowledge were claimed by only 17 per cent of the respondents. In the absence of formal contributions, participation in various forms of informal communication was prominent (60% participated). Within the Biological Laboratories, 65% of the respondents participated in intra- or inter-division discussion groups. In both instances, the percentage is the same or slightly above the average shown by the George Washington University survey.[3] Some apparently recognize the value in these types of communications, because 71% indicated willingness to discuss research plans with extra-division Biological Laboratories persons. The receipt of information is higher (80%), indicating an appetite for information. Significantly, the greatest frequency of contact with other persons in a given field is through the published literature, with technical meetings and personal visits second and third most frequent, respectively. The need for communication of results of research is felt but the means seem extremely vague, indicating need for further orientation to the means of formally reporting results at the Biological Laboratories.

Knowledge of means for acquiring information other than the classical ones, i.e., published literature and meetings, and for disseminating results of research seem to be very hazy and undefined. There is a need for knowledge about others within the installation who are interested in given specialties; no effective mechanism seems to be operating in this area at this time.

Question 24 of this section indicated a heavy benefit from use of the literature, yet the sources of the ideas for research (question 39) were predominantly "direction" or "discussion" with use of the literature assuming only a minor role. What then is the true function of literature? Generally, the need for good communications seems to be recognized. The problem apparently rests in too-scant knowledge of the means for exchanging information systematically, either formally or informally.

D. DO RESPONDENTS HAVE A KNOWLEDGE OR AWARENESS OF ORGANIZATION AND FUNCTIONING OF INFORMATION PROCESS? (Scientist-Technician Questions 43-49).

Questions 43 through 49 were used to evaluate the users' most recent experience in the information-exchange process. The paragraph from the questionnaire and the responses to the questions are listed below.

"In order to get at the functioning information-exchange process from author to user, we would like to concentrate on the last research you engaged in for which a report was written or a manuscript prepared for publication. The questions that follow have to do only with this particular research effort in all of its different phases. Would you then concentrate on this research and think about the total study, from its inception to its conclusion."

Question 43 asked the respondents if any special scientific information influenced them during the course of their research, and if so to indicate how they learned of it.

Special Influence	Respondents
No Answer	28
No	34
Yes	99
Informal Discussions at Meetings	26
Papers	33
Reprints	44
Symposia	19
Books	33
Scanning Journals	77
Discussions within BioLabs	73
Discussions outside BioLabs	32

Question 44 asked the respondents to indicate how they attempted to get the scientific information they needed.

Information Source	Respondents
No Answer	40
Search of Literature	50
Remainder[a]	71

a Combination of literature search, informal discussion, letters, plans for research, concepts, research results, and consultation. Also included were: "Directed," "No attempt," "Don't remember," and "Ask the boss -- he knows it all."

Question 45: If you had any difficulties in obtaining this information what were they?

Difficulties	Respondents
No Answer	81
None	38
Answers[a/]	42

a. Foreign mail service slow; difficulty in purchase of foreign books; ineptitude at literature search; most information not pertinent - therefore I look for concepts; some journals not in Technical Library; not much published or known in area of interest; learning appropriate sources for equipment, etc.; instability of products studied in experimentation; some scientists unwilling to provide all information on any one topic; technical; delay in getting reprints; limited time; references scattered or incomplete; translations take too long; getting information from colleagues outside Biological Laboratories; inability to attend conferences; getting laboratory records; budgeting limitations; partial responses (by information personnel) to requests for information.

Question 46 consisted of several parts. Each part and responses to it are included in the following tabulation.

	Respondents
No answer to entire question	16
Did you submit the research results for journal publication?	
No answer	18
No	77
Yes	50
Were they printed as a Biological Laboratories official report?	
No answer	18
No	49
Yes	77
Was it recorded and classified as security information?	
No answer	26
No	92
Yes	27
Did you have any copies of the scientific information circulated?	
No answer	30
No	68
Yes	47

Question 47: Have you made any oral presentation of this scientific information? If yes, where; if no, would you have liked to present it?

	Respondents
No answer to entire question	18
No	70
Yes	73
If yes, where:	
Scientific Meeting	27
Colloquium outside BioLabs	7
Colloquium within BioLabs	23
Briefing within BioLabs	33
Scientific Committee	8
If no, would you have liked to present it?	
No answer	13
Don't know	1
No	45
Yes	11

Question 48: Have you received any comments on this research? If yes, in what form; if no, would you have liked comments?

	Respondents
No answer to entire question	34
No	32
Yes	95
If yes, what form?	
Written inquiries	40
Reprint request	43
Meeting discussion	39
BioLabs discussion	72
Contractor	1
If no, would you have liked comments?	
No answer	15
No	11
Yes	6

Question 49: Was there some scientific information that you have now that you would have liked to have earlier in this research? Was this scientific information available at that earlier date? How did you find out about it?

	Respondents
No answer	37
No	83
Yes	41
Available earlier?	
No answer	1
No	26
Yes	14
How did you find out about it?	
Information from publisher	1
Pursuing literature	6
Discussion with colleagues outside BioLabs	1
Literature and informal discussion	6
Bibliography sections of related papers	1
Conversations	3
Abstracts	1
Letters	1
Through intelligence channels and in published letters	1
Abstracts and co-workers	1
Scientific experimentation	5
Arising from research	4
Training	1
Through a colleague	2

Summary: Do Respondents have a Knowledge or Awareness of Organization and Functioning of Information Process?

The data collected from these seven questions indicate that the respondents are vaguely aware of the cyclic nature of communications but do not understand the importance of both input and output. For example, the responses to question 4. show that the course of their research was altered by added communication. The contributions made by the respondent during the course of those communications, however, are not indicated. Similarly, responses to question 44 indicate that the respondents gained most of their information in a variety of ways, but do not show their contributions through personal communications.

The data from those two questions and from question 45 show, further, that there are many in whose training there was no emphasis on effective information processes. These persons, if interested, should be restrained and reoriented in their concepts of information processes as influencing operations and management or alternatively information specialists should perform those functions that the scientist-engineer is not equipped to do. Meanwhile, the future scientist-engineers should be trained and encouraged

to participate in good communications and to develop a working understanding of information processes. The first step is to emphasize the role of the user in the gathering and generating of information, because the well-oriented user is the most vital component in the information process. He determines the input and the product of the information process. Information personnel are human enabling mechanisms in the information process - necessary catalysts that speed and ease the process.

Answers to questions 46 and 47 show the dissemination of research results into the information pool. Only about 10% of the respondents did not report their research results in some form, and about one-third circulated their published information. Of those who did not present their results orally, about 15% would have liked the opportunity.

About 60% of the respondents received comments about their work. Most comments were received orally from BioLabs personnel; the remainder were about equally divided among oral discussions at meetings, reprint requests, and written inquiries.

In retrospect, 41 of 161, or 25% of the respondents, had found information at the end of their research that would have been of use to them earlier in their research. This information came from a variety of sources, as indicated in the tabulation.

A frequent administrative problem is the establishment of criteria by which to measure the scientific productivity of an individual, a laboratory, or a research unit. Despite widespread interest in such a standard, no single index has been found that does justice to all individuals or to all laboratories. A commonly used yardstick is a simple count (weighted or unweighted) of all publications of the individual or laboratory, but such a measure has many defects. As Morris Stein[3] has pointed out, "some people are 'creative idea men'; others may not be able to generate the ideas but they are quite creative in the manner in which they present ideas or findings to others. And, to be sure, there are individuals who are 'high' in all aspects of the process."

In evaluating a laboratory, one criterion for measuring productivity is its contribution to the profession by publication; another is its effectiveness in all aspects of information production and use.

"An efficient laboratory would, according to these criteria, be one in which many of the scientists reported few problems in obtaining needed information, in which there was a high degree of success in solving information problems, and in which there was little delay in securing needed data."[3]

E. DO RESPONDENTS HAVE SUGGESTIONS AND RECOMMENDATIONS INDICATIVE OF NEEDS IN INFORMATION FIELD?
(Scientist-Technician Questions 50, 51)
(Supervisor Questions 9, 11, 12)

1. Scientist-Technician Questions

During the development of this questionnaire several questions were asked to elicit some thought on needs in information. Obviously, information personnel are chartered with developing effective information systems. Because information is a tool of the scientist and engineer in research and development, his ideas are important to the development of these tools. In addition, it is well for the scientist and engineer to know the considerations involved in the evolution of information systems so that he can better understand progress in this discipline and use it effectively.

Questions 50 and 51, the final two questions of the scientist-technician questionnaire, invited the respondents to air their views about information problems with which they were personally concerned, and to offer helpful suggestions. To summarize these comments would be to lose some of the true thoughts and expressions of the responses. The responses are therefore shown in the following tabulations; the comments, copied directly from the questionnaires, appear in full, separated by semicolons.

Question 50: In the preceding questions we have attempted to find channels by which you receive and transmit scientific information. Have we missed something you do in order to keep yourself adequately informed in your field and related fields?

	Respondents
No answer	45
No	81
Yes	35

"Purchase of books related to profession; use of accession lists; attendance at journal club within division; attempt cursory monitoring of non-related fields for ideas that are appropriate; you did not ask about the branch libraries, which tend to concentrate material pertinent to the fields represented in the branch; pertinent or relevant literature in the field is circulated by the division to all interested scientific personnel; no, there are relatively few people working in my specific field, hence it is not difficult to keep informed of new developments; attend meetings of the Biochemistry Study Group; reading newspapers, trade papers, state-of-the-art magazines, e.g., Instrument & Apparatus News, Electronic Design, Research & Development Magazine, Industrial Research

"A division Journal Club covers most of the important journals and a punch-card index allows ready reference to all articles covered; a routing of journals to requesting individuals; VR Division Journal Club; there is also a Biochemistry Study Group that invites about eight guests a year; I belong to a Journal Club that attempts to keep up with the current literature; would like to know who else in BioLabs is interested in same or similar projects—Journal Clubs are one way of finding out; attend Journal Clubs in order to keep up with current papers in the literature that might be missed; yes, a question asking me if I'm satisfied with the cross-Directorate communication among groups working on the same project, the answer would have been NO!

"No, library facilities very adequate; read all mechanical magazines from newsstands—same on automotive publications; yes, munitions are being developed at dozens of other installations and activities of the Department of Defense: the cross-winds of technical progress are seldom lasting and rarely penetrate the four walls of each project room; one principal source of information in applied areas of research comes from visiting scientists, etc., who do not give formal lectures or do research at BioLabs (two to three visits per month); communication by mail and phone between scientists working on the same problem; discussion with contractors and industrial concerns."

Question 51: Have you any ideas on how scientific information exchange could be improved? In these laboratories; in your field?

	Respondents
In BioLabs	
No answer	40
No	43
Yes	78
In Your Field	
No answer	68
No	33
Yes	60

Specific answers to this question follow:

"Accession lists could be made up not on a chronological basis, but on a discipline or organism basis. These latter bases would be of more value to the individual scientist. If the Technical Library had a current list of disciplines and organisms of interest to independent investigators, compilations of titles, authors, and/or abstracts could be distributed to interested persons."

"Would it be advantageous to convene an annual session, on an organism basis, for a discussion of various phases of a program? If organisms XYZ were selected, all interested persons could attend a day-long meeting on recent findings in several disciplines on organism XYZ."

"More rapid dissemination of significant or pertinent information related to assignments - from available sources and responsible authorities."

"In my opinion there could be better scientific information exchange if investigators working on similar or possibly identical research projects would meet bi-annually to discuss the results and possible interpretations. This would enable investigators to keep abreast of current information without waiting for the published papers."

"Discussion of quarterly reports of people working in the same field (inter-division) with a question and answer session included."

"Better communications between the professional and technical staff."

"Yes. Give the scientist some help so that he has time to write and exchange information. It is poor economy for a GS-13 to do technician and dish-washing work when he could spend his time at proper levels. Also, if nonproductive paper work were cut out such as questionnaires, more time could be spent on productive research. This is the fourth questionnaire this month."

"A central 'Information Bank' might be set up in or near the Technical Library with a resume or abstract printed on cards, similar to IBM or Remington Rand cards; here the information could be indexed and would cut down on time spent looking up periodicals."

"Emphasize to all scientific personnel the need for and desirability of capsulizing and furnishing scientific information to interested parties. This should be considered a moral obligation of a scientist."

"Scientifically study the problems of communications to (i) increase amount of appropriate information transmitted, (ii) decrease time required to remain cognizant of appropriate information."

"Designate and furnish proper funding to some organizations to be responsible for gleaning from scientific publications information that is available and appropriate to the veterinary profession."

"Not without a potential compromise of security."

"Periodic briefings on research projects currently in progress and problems encountered during the project."

"Wider publishing of the times, places, and subjects of division, etc., seminars, postwide. An initial briefing at time of employment as to research areas and equipment available on post. Formation of an 'Advisory' group of 'eminent' scientists in particular specialties to provide specialized assistance in problem areas."

"More general means of finding persons with specific experience or background."

"Seminars as presently utilized are much too formal. Division seminars on a very informal basis would permit exchange of interesting, useful scientific information, which never becomes sufficiently 'nailed down' for formal presentation."

"Bacto-chemistry (analytical and biochemistry of microorganisms) is a new field, and lacks its own journal, thus pertinent papers are scattered through dozens of publications. This should be rectified."

"None; I consider the present situation to be quite satisfactory."

"Keep scientific journal display in library current. It is very difficult to locate current issues."

"No. Chemical Abstracts is satisfactory."

"Eliminate certain technical editors who are good grammarians but have little knowledge of scientific theory."

"Allow more attendance at scientific meetings so that information may be obtained from more workers outside BioLabs."

"Present facilities are more than adequate - excellent."

"Sometimes scientists interested in published reports are not included in the mailing list."

"The American Phytopathological Society and its geographical divisions facilitate information exchange. This could be improved by a well organized plant-disease survey but the expense of such a survey is prohibitive at present."

"Much information is not published for security reasons. However, this is done to such an extent as to discourage publication. This leads others outside Government service but in the same field of investigation to publish first. Also much useful information is lost in filing safes with no benefit to outsiders."

"Increase capacity of duplicating service at the Technical Library."

"Allow more publishing of research to outsiders thus giving others the benefit of work performed in the field in addition to giving credit to the individuals doing the research."

"Increase circulation of technical summaries and reports between divisions."

"Better translation facilities."

"Seminars in which activity or program, rather than results, is emphasized; let us know who is doing what and why; what information led him into doing what he is doing now and what does he hope to find out as a result of his effort."

"Put the documents reading-room card-files in order."

"Yes. Mimeographed copies of contents pages of newly received journals should be sent in quantity around the post (1 copy per branch) from the major journals, American Institute of Physics Group, American Society of Microbiology Group, American Chemical Society Group, others, e.g., biophysics, medical, crops, engineering, biochemical."

"Let's quit filling out questionnaires for rapid retrieval systems (IBM cards, etc.) and let's get the cards punched! Pertinent information should be sent directly to the person(s) concerned with the information and not sent through many hands before it gets to those interested."

"Computer referral to interested individuals from scanning literature for key words."

"More frequent seminars."

"A regularly scheduled publication or symposium in which various groups working along similar lines would briefly review their work."

"Punch-card files, and more effort in translation of original journals."

"It is apparent that a definite lack of communications exists. Much, if not all, information passed to division gets no further than Division Chiefs or a Branch Chief, who was told to check certain channels of information by the Division Chief. It appears that there is a lack of dissemination from Chief to Indians. (Professional Indians)."

"Journals should have a routing to professional personnel. One should not have to search and seek important journals. They should be handed to these people, making sure everyone gets to see the information. This is not so today at Fort Detrick."

"Provide for more frequent attendance at meetings of national societies. I think all personnel at GS-11 and above should be sent at government expense to at least one meeting per year."

"Attendance regularly at American Society of Microbiology, American Chemical Society, and Federation meetings."

"Concerning personnel exchanges: job descriptions give much information, and I suggest these be coded as to divisions concerned and topic and be available to those 'with a need-to-know.' Then one could talk to others in same field."

"More discussion between closely allied fields. About 10 people (that I know of) are working on similar things. I only know what two are doing."

"Yes, require Army Medical Unit to write reports more often than on an annual basis and circulate these reports to BioLabs."

"It would be helpful if investigators at BioLabs knew of other closely allied projects at BioLabs."

"When groups in other Divisions and Directorates are working on the same program a formal means for conferences, gathering of reports in one place should be set up - case in point, the present ------- Program. The people in the labs are hampered by dissimilar Division reporting schedules and sequences (semi-annual, quarterly, tri-annual reports). Even then no one office collected all the reports in one place, and no regularly scheduled conferences of works from different Divisions was held so as to avoid duplication of effort."

"It would help to know who in other divisions is working on a similar problem and something of their objectives and results. There seems to be some duplication of effort with no exchange of information. Perhaps this information is available at the Directorate or Division level, but it never percolates into the laboratories, or rarely does."

"I know the 'need-to-know' excludes many projects, but it seems to me that at least some general fields of current interest and research could be periodically listed in a small brochure where security would permit. Some sort of brief scientific scoop sheet to let people who are concerned with research know (without breeching security) generally what is going on."

"As mentioned before, some kind of generalized periodic informative sheet describing (where possible) fields of interest and effort."

"Yes. Have some place where workers could relax in the evenings, have a drink, maybe read journals, discuss or just sit and think in pleasant quiet surroundings with good music available."

"Have a small contract let with a knowledgeable consultant or firm in Technical Information area and evaluate your present facility and services."

"I like what we have."

"Earlier brief status abstracting of work in progress, not quarterly or semi-annual reporting when work is completed. Reduction in jealous parental guarding of information that will be published in open literature to prevent others from getting into the act."

"Direct contact between engineers and technicians doing the work. No Middle Man!"

"Need-to-know must be expanded by an element not responsible for some original work in the field, rather a technical liaison group which is on the move and assisting in the proper dissemination of technical progress records among the really interested working groups."

"Our supervisors share very little of the knowledge obtained in meetings with, and visits to, other project managers. There seems to be distrust and professional pride that prevents a fair exchange of information among supervisors of the creative workers."

"Systems appear adequate. It is believed full use is not made of existing system."

"System appears adequate."

"More outside meeting attendance for disciplines other than biological."

"More frequent discussions with qualified investigators, particularly outside BioLabs. Training of superiors to encourage literature reading and training of all personnel to evaluate scientific literature."

"Informal round table discussions of scientific personnel in specific areas."

"Symposia or more informal meetings of interested persons."

"Machine records and recall. More lateral communications."

"Follow lead of information scientists."

"Yes. Ask scientists starting on new projects or phases to certify that they have a complete bibliography of the art."

"Insist that investigators in the Army cooperate with full revelations of their projects to other Army scientists who have clearance and a need-to-know."

2. Supervisor Questions

Only one of the supervisors failed to answer Question 9, What other mechanism do you use to keep yourself adequately informed in your field and related fields? The most popular answers were contained in the category "formal and informal discussion," which included briefings, meetings, consultants' visits, lectures, and seminars. Other categories included "literature," review articles, browsing at home and at work, news media, trade journals, manufacturers' literature, bibliographies, publishers' lists, government agency reports, government contractor reports, and Quadripartite reports. "Liaison" included informal coordination, correspondence, and discussions with contractors. "Capsule and key information" included punched-card reference system, reprint file, abstracting service, and citation index. Finally, course-work or training was included.

Question 11: What suggestions do you have in regard to better communication at the Biological Laboratories?

	Respondents
No answer	11
None	10
Answers	43

As in the scientist-technician questionnaire, more meaning will be conveyed by using the respondents' words than by summarizing them. The answers are therefore quoted below.

"Each area should prepare an interest list of topics (i.e., serological methods, vaccine development, rapid diagnostic test methods) that directly pertain to its work; information should be funneled directly to working source. Wider attendance at seminars."

"Means of communication are available; better use and exploitation desirable—involves a matter of time, which is difficult to find."

"Encourage senior investigators to thoroughly and continually brief subordinates. Careful consideration to the importance of any mandatory meetings to allow maximum utilization of scientific personnel in research activities and necessary communicative meetings."

"Better knowledge of experience and fields, specialization of top personnel, to get to know individual specialization, competence with object in mind of promoting more cooperative research. Cross-fertilization of capabilities."

"Prepare questionnaire to determine interests of scientists, then encourage study groups in various selected specialties such as air sampling, decontamination, air filtration, aerobiology, etc."

"Wider distribution of summaries of quarterly reports from divisions."

"Recommend to the division chief that knowledgeable representative be required to become familiar with other divisions' programs and to pass pertinent related information to technical subordinates."

"Greater distribution of reports."

"Encourage use of existing mechanisms."

"More seminars and/or better publicity regarding seminars and meetings in other divisions. It should be official policy to open division seminars to all interested persons and to publicize them."

"Establish cooperative research projects between Divisions with exchange of laboratory space and personnel."

"Require the Medical Unit to write more reports, more often than annual basis."

"More frequent symposia for discussion of <u>classified programs</u>."

"Specialists attached to library who are capable of making literature surveys on selected subjects of interest to BioLabs. Also, bibliographies. Also abstracting."

"To perfect the technique of pursuing literature and disseminating pertinent references or information to interested investigators.

"Circulation of a <u>brief</u> summary report of activities in a <u>Directorate</u> - semiannually or annually."

"There should be a system for making reprint copies of articles on request of scientists. At some institutions current journals are circulated among the scientific personnel. Anyone interested in a particular article simply initials the title page, and a copy of the article is made for his personal use.

"Speed up translation services. Have on-post translators if possible. I encourage my people to apply for orders to attend relevant scientific meetings. However, since the money available in our Division for travel to scientific meetings is not sufficient to permit each of the professional personnel to attend even one meeting per year, decisions as to who shall attend what meeting are made at the Division level."

"More of a variety of guest lecturers and more informal inter-division discussions, provided the discussions are about material pertinent to all involved and relative to common programs and the mission."

"Obtaining more time to communicate by eliminating a lot of the paperwork - SUCH AS THESE FORMS."

"Less redundancy."

"Both informal and formal discussions with investigators in other divisions."

"Issue periodically summary of research briefs or progress reports of various divisions of unclassified nature."

"Time released by lessening of purely administrative work loads."

"A clearer management delineation of and coordination of the various programs and disciplines; minimization of paper work, and service time to accomplish communications."

"Fewer administrative and budget meetings, more interest by Director and his staff in scientific problems."

"Emphasize technical communication; cut out many of the administrative meetings where at all possible."

"My main problem is lack of time!!"

"Objective cooperation between organizations would provide a direct flow of information to interested parties."

"The combining or logical organization of similar functions would improve and simplify the work processes."

"Fewer 'layers' for information to travel through."

"More formal documentation. It must be timely - not months after it has already been made known through word of mouth."

"Wider dissemination of dates and subjects of divisions' meetings and seminars."

"Technical Library should advertise more in Daily Bulletin, etc."

"Construction of a new theater that would accommodate large groups and would be equipped with modern visual aids and training equipment."

"That Program Coordination Office at a minimum of four times per annum put out review or survey documents as to what has been done or yet should be done in a fiscal year program using the Program Coordination Office's FY document as a basic reference."

"Periodic abstracts of all completed work at Fort Detrick under subject headings in a single document."

"We need better data retrieval systems. What happened to Dr. Batchelor's work at BioMath?"

"Communication within BioLabs is considered good, but we should continually strive for improvement by research (and state-of-the-art cognizance) on modern methods."

"More staff in Technical Library."

"Fewer, more meaningful meetings. Effective distribution (to branch level) of releases now read and destroyed at Division level. Educational programs regarding what is available where in what form. Supervisory insistence on proof of a search for all information available."

About half of the persons answering the supervisor questionnaire responded with affirmative answers to Question 12, More generally, what suggestions do you have in regard to better communication in the scientific community?

As in the previous questions, we feel it most appropriate to quote the answers directly from the questionnaires. Some of the comments are indications of some basic dissatisfaction. Other comments amount to the granting of a charter to information persons to proceed with information systems that they feel will be appropriate to the needs of scientists and engineers. Others are quite participative in tone and are particularly useful to information-systems designers. In the sense of good communication, these remarks are reproduced here so that those involved in management, operations, and information may benefit from expressions of thought and feeling that might otherwise remain repressed or communicated only in attenuated form.

Response of management, operations, and information personnel to these ideas and expressions of fellings will determine in part the value of a questionnaire such as this and will justify or condemn the use of human resources in the answering of this questionnaire. We regret that others did not or were not permitted to avail themselves of this opportunity to express themselves on communications and information processes at BioLabs.

Suggestions	Respondents
No answer	21
None	14
Answers	29

"More flexibility to attend scientific sessions with chief interested parties to have priority if a priority must be had."

"At the professional level of my interests, this is no problem. The element of time is the only limiting factor."

"Increased emphasis on scientific approaches to the general problem of communication."

"Encouragement of attendance at meetings (scientific) by top personnel."

"Better schooling."

"Study groups could present their findings as well as those at other scientific centers once per six months."

"More efficient method of publishing papers in the various journals - time delay is too long between time of submission and actual time of publication."

"More symposiums on specific topics at national scientific meetings."

"Scientific communication at Fort Detrick is usually poor. Whether this is due to the specter of security that has carried over to all communication, I don't know. There is a need for more rapid circulation of reports. While information concerning acquisitions at the library and the 'open literature bulletin' are helpful with regard to the open literature, it is more difficult - again because of security - to obtain a listing of technical reports concerning work done at Fort Detrick. In general, the situation at Fort Detrick is not conducive to good communication. Security (which is not quite the ogre it may seem to some) and safety (which has influenced the physical structure of the laboratories and insured the isolation of small groups of individuals) are also important. Changing clothes to go into or to leave the laboratories is, I feel, a factor in the lack of communication. People have a certain degree of inertia and this adds to the problem. Once I get into

the laboratory, I tend to remain there while the list of references I have accumulated grows and grows but doesn't seem to get read. The problem, therefore, is a combination of (1) the investigator, (2) security, (3) safety, (4) poor publicity for division seminars."

"More liberal policy for attendance at scientific meetings.

"More liberal financial support for travel to scientific meetings.

"More effective abstracting with judicious indexing and cataloging - especially of articles in foreign languages."

"A system where one can obtain an abstract card of any article in current published literature that may be kept in personal reference files and for which a complete copy is available."

"General seminars on research progress of various divisions."

"Publication of articles and papers of significant interest to the scientific community."

"Mandatory attendance to at least one scientific meeting per year (for each principal investigator). At least two weeks TDY to a laboratory where similar or related research is going on (for each principal investigator)."

"Fewer, better papers."

"Better funding to allow for more travel to scientific meetings and conferences."

"Too much time and effort is spent on trash forms, personnel directives and memos, security forms, and other nonproductive paper work. If half of this effort were spent on scientific discussion it would be helpful. If a scientific advisor were <u>available</u> to advise and consult on detailed problems and approaches this would be helpful. A well-qualified <u>available</u> scientific advisor should be placed in every directorate to internally advise and be available when needed, and to provide cross-stimulation of ideas and methods. Present scientific director-advisor cannot perform this function for laboratory supervisors."

"Encourage technical seminars if possible (even) at expense of some briefings. Seminars should be of participative nature for attendees."

"Increased cooperation between divisions and branches, possibly through dual project assignments."

"Selective dissemination of information and symposia - more and better."

"More frequent circulation of new book accessions and abstracts."

"Fewer security restrictions on Fort Detrick research."

"Have more general symposiums sponsored by Fort Detrick similar to the one held at Hood College some years ago."

"I would like to see an annual directory of post professionals at the GS-11 and higher level with a short list of special fields of competency. This might increase lateral communications. Most of the communications at Fort Detrick are of the vertical type. The greatest weakness here is in the lateral communications of the middle grade levels (GS-11 thru 13)."

"Communication implies a willingness to give of one's own knowledge, opinions, and attitude. This can be achieved only in an atmosphere of mutual respect, trust, and cooperation. Reticence - both personal and verbal - stems from indecision and insecurity. Ergo, establishment of increased atmosphere of security should lead to freer communication. In concrete terms, consistency of plans, programs, schedules, regulations - some pattern of performance so that personnel could commit themselves to a long-range plan - would set the stage for better communication."

V. CONCLUSIONS AND RECOMMENDATIONS

The compilation and synthesis of the mass of information provided by these questionnaires has resulted in a quite-consistent pattern of opinions, attitudes, and needs.

If this questionnaire is to have maximum value, some action must be taken as a result of these findings; furthermore, the needs expressed or implied cannot all be fulfilled by any one group or organization. For that reason, the problems revealed, and their implied solutions, have been sorted into three categories or areas of action. Some problems require solution by information personnel; for certain others, information personnel can provide guidance and encouragement, but cannot alone provide the solution; in still others, only management can improve the situation.

Two problem areas strikingly revealed by this questionnaire were the need for increased awareness by scientific personnel of the role of information (both its generation and its use) in the R&D complex and the usefulness of increased informational services to the scientist. In both these areas, the major responsibility is obviously that of the information specialist.

"Increased awareness" includes initial orientation of the new employee regarding the role of information in the mission of the BioLabs, the information services available to him, means at his disposal for best exploiting those services, and his responsibilities in maintaining the cyclic flow of knowledge. This increased awareness, to be effective, must also exist in the current staff and must be reinforced by a continuing process of informing the mission elements of changes or additional services as they are instituted and by maintaining constant liaison for maximum efficiency of the services.

In the year since this questionnaire was distributed, additional services have been instituted to fulfill the major expressed needs. These include the Technical Effort Locator (TEL), the need for which was expressed repeatedly as a need for "knowing who else is doing what." In addition, the widespread complaint of too much literature, too little time will to some extent be offset by Selective Dissemination of Information (SDI), which will channel information to scientists selectively, according to their interests.

The problems of increasingly heavy translation loads, faster publication, greater library holdings, more bibliographies, and more meaningful distribution are all in the purview of the information specialists.

In certain other problem areas, as indicated by the questionnaire, the information specialists may assist in the solution, but management must bear the greater responsibility. Information personnel can encourage

additional formal documentation to maintain the cyclic flow of knowledge, and can provide assistance at every step, but only management can provide the incentive, the time, and if necessary the requirement, for adequate documentation.

In addition, information and mission management must work together to improve the dissemination of information throughout the work force. The complaint that information stops at the managerial level is repeated too often to be brushed aside.

A related group of problems indicated in this questionnaire devolves squarely upon management. Recurrent pleas, variously expressed, for time to think, for greater meaningful contact with others with similar interests, and for closer in-house coordination of mission programs must be considered at least to some extent indicative of the morale of the respondents. References, some indicating candid resentment, to the overload of paper work, to reluctance of others to share research results, and to the desire to discuss their material, particularly with off-post counterparts, are so numerous that they cannot be written off merely as chronic gripes. Many of them seem only incidentally related to any specific problem of technical information, but they are certainly of potential deep concern to management.

APPENDIX A

BIOLOGICAL SCIENCES COMMUNICATION PROJECT, AIBS

1. Year of Birth _____

2. Sex _____

3. Highest Earned Academic Degree (if you have more than one advanced degree, use one column for each.)

Highest Degree	_____	_____	_____
Year Granted	_____	_____	_____
Institution	_____	_____	_____
Major field	_____	_____	_____
Minor field	_____	_____	_____

4. Present Position Title _____

5. How long have you held this position? _____

6. In addition to the duties of your present position, are you engaged in any of the following outside activities?

_____ Member of an advisory panel
_____ Officer or member of a committee of a scientific society
_____ Editor or associate editor of journal
_____ Teaching
_____ Consulting
_____ Other (Please specify)

7. How long have you been employed in this laboratory or department? _____

8. What is your present field of specialization? Place a check before the appropriate one(s).

___ Agriculture & Food Chemistry
___ Agronomy
___ Anatomy
___ Animal Husbandry
___ Bacteriology
___ Biochemistry
___ Biophysics
___ Botany
___ Ecology
___ Entomology
___ Fish and Wildlife
___ Forestry & Range Science
___ Genetics
___ Horticulture
___ Immunology
___ Nutrition
___ Oceanography
___ Paleontology & Paleobotany
___ Pathology
___ Pharmacology
___ Physiology
___ Phytopathology
___ Psychology
___ Soil Science
___ Taxonomy
___ Virology
___ Zoology
___ Other (Please specify)
_____
_____

9. Is there a more specific field with which you are currently identified? Yes ___ Nc ___. If YES, what is it? _____

10. Are you the only one interested in this specialty in this laboratory or department? Yes ___ No ___. If NO, who else? (Give names) _____

11. From the list below please select a maximum of three activities which take up most of your working time. Include in this all professional activities you engage in. Use the number 1 for the most time-consuming, 2 for the second most, and 3 for the third. Check any others which also apply.

Rank three and check others which apply

Research (individual or group) . . . . . ___
Research guidance (of subordinates, students) . . . ___
Management or administration of research . . . . . ___
Administration (other than research) . . . . . ___
Teaching . . . . . ___
Consulting . . . . . ___
Writing reports . . . . . ___
Editing . . . . . ___
Receiving instruction or training . . . . . ___
Other (Please specify) . . . . . ___

12. Who is your immediate supervisor? _____

13. About how frequently do you have discussions with your supervisor about your work?

_____one or more a day _____a few times per week
_____once a week or less often

14. Are these discussions scheduled regularly? Yes___ No___. If NO, who usually initiates them?

_____you _____your supervisor _____about half and half by each of you

We would like to know something about the facilities available for information exchange in your present position.

15. What library or libraries do you use? _____

16. Which library do you use most frequently? _____

17. Does any library you use offer any of the following services? Give the name of the library for each offered. (If you do not know what services are offered, please skip to 18)

    information & reference services _____
    interlibrary loans _____
    photoreproduction & duplicating facilities _____
    translation services _____
    bibliographic service _____
    routing of appropriate journals _____

18. Are there any services you would like to have that your library or libraries do not offer? Yes___ No___. If YES, what? _____
    _____

19. Is there any unique or special service offered by any of the libraries you use that you find especially useful? Yes___ No___.
    If YES, what? _____

20. Is there any limitation on your professional use of the telephone? For local calls?_____ For long distance calls?_____
    Could you specify the limitation? _____

21. Is there any limitation on the number of trips you can make in connection with your work? For local trips?_____ For travel to other cities?_____ For travel to other countries?_____ Are your travel expenses to conventions paid only if you participate?_____
    Could you specify any other limitations?_____

22. About how many days did you spend away from your office on professional work during the last twelve months?_____

23. During the last twelve months did you have any temporary appointments at other institutions? Yes___ No___. If YES, for how long?_____

24. Do you have any assistants assigned to you? Yes___ No___. If YES, how many?_____ Is/are your assistant(s) supposed to route scientific material to you? Yes___ No___.

25. Do you ordinarily have outside paid consultants available for your work? Yes___ No___. If NO, have you ever felt it would be a good idea to call in an outsider for consultation on your research? Yes___ No___. Would this be possible in your present position? Yes___ No___. Have you ever done this? Yes___ No___.

26. Does your laboratory have visiting scientists come in to give lectures or do research? Yes___ No___. (If you are in a University, this refers to your department; if you are in an Institute or an independent laboratory, this refers to the whole Institute or laboratory.)

If YES, is this a regular program? Yes___ No___
In the last twelve months, how frequently did this occur?_____
Have you had any personal conversations about your work with such visiting scientists during the past twelve months?
Yes___ No___ If YES, how many times?_____

27. Have you visited any other laboratories outside of your own institution within the last twelve months? Yes___ No___. If YES, which? Please name them_____

28. What scientific or professional societies are you a member of?

_____

29. What society meetings did you attend within the last twelve months? (Please include meetings you attended even though you were not a member of the society or group)

_____

30. Did you obtain any significant information at any of these meetings? Yes___ No___. If YES, where did you learn it?

____paper reading session
____symposium
____exhibit
____motion picture or TV presentation
____informal discussion

31. Have you given any papers or presented any addresses at symposia or the like at any meetings within the last twelve months? Yes___ No___. If YES, at what meeting(s)?

_____

32. Are you a member of any group that informally discusses research? Yes___ No___. If YES, about how many people are in the group?_____
Are there any scientific disciplines other than life sciences represented in your group? Yes___ No___
Are all the participants in this group from your department or laboratory? Yes___ No___.
About how often does it meet? ___per___ Approximately when did this group form?_____
Which of the following kinds of material are discussed? (Place a check before as many as are appropriate.)

___completed research
___research in progress
___negative findings
___new techniques or apparatus
___problems in locating or identifying specimens

33. Are you reluctant to discuss your own new research plans with people outside your own laboratory or department? Yes___ No___

34. Is there anyone within your department or within the institution that you ordinarily refer scientific material to? (This material might be in the form of scientific information heard at conventions or articles in journals, etc.) Yes___ No___. If YES, approximately how many? ___

35. Is there anyone within your department or within the institution (other than librarians) who ordinarily refers scientific material to you? (This material might be in the form of scientific information heard at conventions or articles in journals, etc.) Yes___ No___. If YES, approximately how many? _____

36. Is there anyone outside the institution that you ordinarily refer scientific materials to? Yes___ No___. If YES, approximately how many? _____

37. Is there anyone outside the institution who ordinarily refers scientific information to you? Yes___ No___. If YES, approximately how many? _____

38. Now consider your own specialty. Who, in your opinion, are the living individuals whose work you respect most? For each of the individuals you name, could you check in the appropriate column(s) the nature of the contact you have with him or her?

Name	Location	Technical Literature	Phone	Mail	See at Meetings	Visits

Since the scientific literature represents an important source of scientific information, we would like to find out about the specific publications you use.

39. Please turn to the accompanying list of selected titles and check in the appropriate columns, being certain to add any journals that are appropriate to your use.

40. Are there any journals that you started looking at within the last twelve months? Yes___ No___. If YES, which? For each such journal, can you recall how it came to your attention?

Name of Journal	Brought to Attention by

41. Please list any other publications (excluding journals) significant to you that you read or scan.

_____

42. Have there been any new journals published in your field in the last twelve months? Please list any.

_____

43. Do you use the Biological Abstracts? Yes___ No___.
If YES, about how often during the last twelve months have you used it? _____
When was the last time you used it? _____

44. Do you use any other Abstracts not listed? Yes___ No___. If YES, please list them:

_____

45. Do you use Current Contents? Yes___ No___. If YES, about how often during the last twelve months have you used it? _____
When was the last time you used it? _____

46. Do you use any other bibliographic services? This would include automatic data processing systems as information storage and retrieval facilities. Yes___ No___ Please specify. _____

Now we'd like to consider briefly a few questions about your research.

47. About how many of each of the following materials have you authored or co-authored?

_____journal articles _____chapters in books
_____books _____technical reports or bulletins

48. Of the total indicated above, about how many were completed within the past five years? Approximately _____

49. Which journals do you prefer to publish in? _____

50. Are you a member of any reprint or preprint exchange group? Yes___ No___. If YES, about how many people are involved? _____
When approximately did this practice start? _____

51. Are you on anyone else's mailing list to receive copies of any work done? Yes___ No___. If YES, about how many persons have you requested this from? Approximately _____ persons.

52. Do you send copies of your work to a regular mailing list? Yes___ No___.
If YES, about how many people are on this list? _____
What form are these copies in?
____informal (Mimeographed, etc opies
____preprints
____reprints
____other (please specify) _____

53. Have you ever completed any research and then not published it in journal or book form? Yes___ No___. If YES, could you estimate about how much of your research has NOT been published in book or journal form?

_____most of it
_____about a quarter
_____about half
_____little or none

54. Think about the LAST research you completed and did not publish. Which of the following reasons best describes why you did not:

____inconclusive results
____loss of interest
____lack of time
____prior publication by other scientist
____rejected by journal
____lack of financial support
____other (please specify)
_____

55. Are you currently engaged in research? Yes___ No___. If YES, would you characterize it as a planned program of research or is it more in the nature of single experiments? Program___ Single experiment___

56. Where did you get the idea for this research?

____informal discussion
____literature
____mixture of formal and informal ways
____cannot recall

57. Who determined this research problem?

____supervisor
____self, with formal approval of others
____self, without formal approval of others

58. Is it a group project? Yes___ No___. If YES, who are the members of the group? _____

59. With whom do you discuss this research most frequently? _____

_____

In order to get at the functioning information-exchange process from author to user, we would like to concentrate now on the last research you engaged in, for which a final report was written or a manuscript prepared for publication. The questions which follow have to do only with this particular piece of research, in all of its different phases. Would you then concentrate on this research and think about the total study, from its inception to its conclusion.

60. Was there any special information you received that influenced you during the course of the research? Yes___ No___. If YES, how did you learn of it? (Check more than one if appropriate)

____attending papers at conventions
____attending symposia at conventions
____scanning or reading of journals
____informal discussion at conventions
____preprints, reprints, or abstracts from author
____books or monographs
____informal discussions with colleagues within employing institution
____informal discussion with colleagues outside
____verbal or written reports from students or assistants
____TV, radio, movies
____other (Please specify)

61. Did you have any problems in obtaining scientific information that you needed? Yes___ No___. If YES, could you describe what the problems were? _____

62. How did you attempt to get the information you needed? Try to recall the steps, in sequence, that you took to obtain it. _____
Were you successful? Yes___ No___

63. Did any information reach you accidentally that had a direct bearing on your research? Yes___ No___
If YES, could you describe what the information was? (If you have already mentioned this kind of incident in one of your answers to the above questions, please indicate here merely which of the above is appropriate) _____
Through what channels did this information reach you? (See list in No. 60)_____

Now to get at the information transmission process, we would like to concentrate on how you acquainted others with the research. Please continue to consider only this same last completed study.

64. Did you submit the research for journal publication? Yes___ No___
Was it printed as a technical report? Yes___ No___
Was it recorded and classified as security information or company confidential? Yes___ No___
Did you circulate any copies of the findings to any group? Yes___ No___

65. Have you made any oral presentations of the material? Yes___ No___
If YES, where?

____a scientific society meeting
____a colloquium within your institution
____a colloquium outside your institution
____a scientific committee
____the contracting or granting agency
____other (Please specify)_____

66. Have you received any comments (either written or oral) on this research? Yes___ No___. If YES, what form has this taken?

___written inquiries about certain phases
___requests for reprints
___discussion by colleagues at meetings
___other (Please specify)_____

67. Was there some information you now have that you would have liked to have had earlier in this research? Yes___ No___
If YES, was this information available at an earlier date?
Yes___ No___
How did you find out about it?_____

68. In the preceding questions, we have attempted to find channels by which you receive and transmit information. Have we missed something you do in order to keep up with the latest developments in your field?

69. In review, which are the methods you find most useful in keeping abreast of your field?

70. Have you any ideas how scientific information exchange could be improved?

APPENDIX B

(PART I)

-- COPY --

SMUFD-TS-TI Communications Questionnaire

Dir/Tech Svcs
Dir/Biol Rsch
Dir/Development
Dir/Med Rsch

Ch, Tech Info Division

10 Jul 1964
hh/5102

1. Attached please find the requisite number of copies of two types of questionnaires (one for supervisory persons, and one for scientist-technicians [non-supervisory]) designed to ascertain the status of communications at the Biological Laboratories.

2. The questionnaire is the product of collaborative efforts, contribution, and suggestions of Biological Laboratories' personnel at division and directorate levels, and Biomathematics Division.

3. Identification of the respondents should remain unknown. The questionnaires are numbered so that the number distributed and returned by directorate may be known.

4. Your cooperation and assistance are requested in distributing the questionnaires to the appropriate individuals. The questionnaire should be completed and returned without any identifying marks directly to:

Dr. George H. Nelson
Bldg. T-816

5. A summary of answers will be prepared in cooperation with Biomathematics Division and made available to you. There is no time limit; however, we would like to compile and publish results early in October.

6. Participation of all qualified personnel is encouraged.

GERALD W. BEVERIDGE
Chief
Technical Information Division

-- COPY --

APPENDIX B

(PART II)

INSTRUCTIONS

Supervisory Personnel

1. Attached please find a 1-page questionnaire designed for response by supervisors. Responses are urged to help determine the status of communications among professionals at the Biological Laboratories. Such knowledge is needed to guide the direction of the information program toward maximum effectiveness.

2. Please do not identify yourself in any way. The questionnaire will be provided to you by your Administrative Officer. He has been asked not to identify persons and responses. The questionnaires are numbered so that the number distributed and returned by directorate may be known.

3. The completed questionnaire (without identifying marks) should be sent directly to:

Dr. George H. Nelson
Bldg. T-816

4. Your cooperation and effort are greatly appreciated. A summary of answers will be prepared in cooperation with Biomathematics Division and will be made available to your Director. There is no time limit; however, we would like to compile and publish results early in October.

Incl 1

GERALD W. LEVERIDGE
Chief
Technical Information Division

BIOLOGICAL LABORATORIES
COMMUNICATION

Supervisory

1. Do you have a regular staff meeting? Yes___ No___.
   If so, how often? Weekly___ Monthly___ Quarterly___ Semi-annually___

2. What is your policy about attending scientific meetings? _____
   _____
   _____

3. Is a visiting lecturer program active in your division? Yes___ No___.

4. How frequently do you have intra-division meetings or seminars?
   Weekly___ Monthly___ Quarterly___ Semi-annually___.
   How frequently do you have inter-division meetings or seminars?
   Weekly___ Monthly___ Quarterly___ Semi-annually___.

5. Do you have any formal mechanism for exchanging scientific information with other supervisory persons? Yes___ No___.

6. Do you encourage the use of the Biological Laboratories' Tech Library? Yes___ No___.

7. How do you prefer to select your reference sources? From a regularly published bibliography with descriptor words ___, with abstracts ___, with both___, with neither___. By browsing through references in the Technical Library___, by "word of mouth"___.

8. How do you prefer to do your reference work? No reference work done___, in the Technical Library___, in my office with bibliographic and abstract sources___, in my office with verbatim copy of original article___, at home___, by listening to lectures___.

9. What other mechanism do you use to keep yourself adequately informed in your field and related fields? _____
   _____
   _____
   _____

10. Do you exchange technical information with subordinates? Yes___ No___.

11. What suggestions do you have in regard to better communication at the Biological Laboratories?_____
    _____

12. More generally, what suggestions do you have in regard to better communication in the scientific community?_____
    _____

APPENDIX B (continued)

(PART III)

INSTRUCTIONS 10 July 1964

Scientists-Technicians

1. Attached please find a questionnaire designed for responses by scientists-technicians (non-supervisory). It is a product of the contributions and suggestions of local scientists. Responses are urged to help determine the status of communications among scientists and related professionals at the Biological Laboratories. Such knowledge is needed in order to guide the direction of the information program toward maximum effectiveness.

2. Please do not identify yourself in any way. The questionnaire will be provided to you by your Administrative Officer. He has been asked not to identify persons with answers. The questionnaires are numbered so that the number distributed and returned by directorate may be known. The completed questionnaires (without identifying marks) should be sent directly to:

Dr. George H. Nelson
Bldg. T-816

3. Your cooperation and effort are greatly appreciated. A summary of answers will be prepared in cooperation with Biomathematics Division and will be made available to your Director. There is no time limit; however, we would like to compile and publish results early in October.

Incl 2

GERALD W. BEVERIDGE
Chief
Technical Information Division

BIOLOGICAL LABORATORIES COMMUNICATION

Scientists - Technicians

1. Highest earned academic degree (if you have more than one advanced degree, use one line for each).

Degree	Year	Institution

2. How long have you been employed at the Biological Laboratories?
_____Years.

3. What is your present field of specialization? Place a check before the appropriate one(s).

___Aerobiology
___Agriculture & Food Chemistry
___Agronomy
___Anatomy
___Animal Husbandry
___Bacteriology
___Biochemistry
___Bio-engineering
___Biophysics
___Botany
___Cloud Studies
___Crops
___Cryobiology
___Ecology
___Engineering
___Entomology
___Epidemiology
___Genetics
___Gnotobiology
___Immunobiology
___Information Sciences
___Materials Deterioration
___Mathematics
___Medicine
___Meteorology
___Nutrition
___Pathology
___Pharmacology
___Physics
___Physiology
___Phytopathology
___Psychology
___Safety
___Soil Sciences
___Statistics
___Taxonomy
___Testing
___Veterinary Medicine
___Virology
___Zoology
___Other (Please specify)

4. How many other scientists at the Biological Laboratories are interested in this specialty?_____

5. From the list below, please select a maximum of three (3) activities which take up most of your working time. Include in this all professional activities you engage in. Use the number 1 for the most time-consuming, 2 for the second most, and 3 for the third. Check any others which also apply.

Research (Individual or group) . . . . . ___
Teaching . . . . . ___
Consulting . . . . . ___
Presenting R&D results in briefings, staff meetings, etc . . . ___
Liaison with contractors & other R&D establishments . . . . . ___
Writing reports . . . . . ___
Using information sources . . . . . ___
Training . . . . . ___
Other (Please specify)_____ . . ___

We would like to know something about the resources available for technical information exchange in your present position.

6. How frequently do you use the Biological Laboratories' Technical Library?
___Once a week ___Once a month ___Rarely ___Daily.

7. What other technical library or libraries do you use?_____

_____

_____

_____

8. Which technical library do you use most frequently?_____

_____

9. Are you aware that the Biological Laboratories' Technical Library offers the following services?

Information & reference services	Yes___	No___
Interlibrary loans	Yes___	No___
Duplicating services	Yes___	No___
Translation services	Yes___	No___
Bibliographic services	Yes___	No___
Routing of appropriate references	Yes___	No___

10. Are there any services that you would like to have that the Biological Laboratories' Technical Library does not offer? Yes___ No___. If YES, what?_____

_____

_____

11. Is there any unique or special service offered by any of the other technical libraries that you use that you would find especially useful in the Biological Laboratories' Technical Library? Yes___ No___. If YES, what?_____

_____

_____

_____

12. Do you work with any other scientists or technicians as a member of a team? Yes___ No___. If YES, how many on the team?___. Is/are your co-worker(s) supposed to route scientific information to you? Yes___ No___.

13. How often do outside consultants come to your division to give lectures or do research?_____ times per _____.

14. How often do visiting scientists come to your division to give lectures or do research? _____ times per _____.

15. Of what scientific or professional societies are you a member?

_____

_____

_____

_____

16. What scientific or technical meetings did you attend within the last twelve (12) months? (Please include meetings you attended even though you were not a member of the society or group) _____

_____

_____

_____

17. Did you obtain any significant scientific information at any of these meetings? Yes___ No___. If YES, where did you learn it?

___Paper reading session
___Exhibit
___Symposium
___Motion picture or TV presentation
___Informal discussion
___Other (please specify)

18. Have you given any papers or presented any addresses at symposia or the like at any meetings within the last twelve (12) months? Yes___ No___.

19. Do you participate in any intra- and/or inter-division discussion groups? Yes___ No___.

20. Are you reluctant to discuss your own new research plans with extra-division Biological Laboratories persons? Yes___ No___.

21. Is there anyone within your branch or division or within the Biological Laboratories to whom you ordinarily refer scientific information or data? (This might be scientific information or data derived from conventions or journals.) Yes___ No___. If YES, approximately how many persons? _____

22. Is there anyone within your branch or division or within the Biological Laboratories (other than librarians) who ordinarily refers scientific information or data to you? (This might be scientific information or data derived from conventions or journals.) Yes___ No___.

23. Is there anyone outside the Biological Laboratories who ordinarily refers scientific information or data to you? Yes___ No___.

24. Now consider your own specialty. What fields of effort are of the greatest scientific benefit to you, and what is the nature of your contact with persons in these fields?

	Nature of Contact				
Field of Interest	Technical Literature	Phone	Mail	Technical Meetings	Personal Visits

Since it usually is considered that the scientific literature represents an important source of scientific information, we would like to find out about the specific publications that you use.

25. Please list professional, scientific and technical journals to which you regularly refer. _____

26. Please list any other scientific publications significant to you or your work that you read or scan. _____

27. List any new journals which have been started in your field in the last twelve (12) months. _____

_____

_____

_____

28. How frequently do you use Biological Abstracts? ___ times per _____.

29. What other abstracts do you use?

Title of Abstracts Publication	Frequency of Use

30. Do you use Current Contents? Yes___ No___.

31. Do you use any other bibliographic services for scientific references? Yes___ No___.

Now we'd like to consider briefly a few questions about your research.

32. About how many of each of the following products have you authored or co-authored?

____Journal Articles ____Chapters in Books
____Books ____BioLabs' Official Reports
____Other (Please explain)

33. Of the total indicated above, about how many were completed within the past five (5) years? Approximately ____.

34. Are you a member of any reprint or preprint exchange group? Yes___ No___.

35. Are you on anyone else's mailing list to receive copies of any work done? Yes___ No___. If YES, from how many persons have you requested such courtesy? Approximately ____.

36. Do you have copies of your work sent to a regular mailing list? Yes___ No___.

37. About how much of your research has not been published in journal form? Approximately _____ per cent.

38. Think about the LAST research you completed and did not publish. Indicate the reasons.

___Inconclusive results
___Lack of time
___Other (please specify)
___Prior publication by other scientist
___Change of program

39. Are you currently engaged in research? Yes___ No___.

40. Where did you get the idea for this research?

___Informal discussion
___Mixture of formal & informal ways
___Directed
___Literature
___Cannot recall

41. Is your project a group effort? Yes___ No___.

42. With whom do you discuss this research most frequently? (By discipline or occupation, not proper name) _____

In order to get at the functioning information-exchange process from author to user, we would like to concentrate on the last research you engaged in, for which a report was written or a manuscript prepared for publication. The questions which follow have to do only with this particular research effort in all of its different phases. Would you then concentrate on this research and think about the total study, from its inception to its conclusion.

43. Was there any special scientific information that you received that influenced you during the course of the research? Yes___ No___.
If YES, how did you learn of it? (Check more than one, if appropriate).

___Attending papers at conventions
___Attending symposia at conventions
___Scanning or reading of journals
___Informal discussion at conventions
___Preprints, reprints, or abstracts from author
___Books or monographs
___Informal discussions with colleagues within BioLabs
___Informal discussions with colleagues outside BioLabs
___Other (Please specify)

44. How did you attempt to get the scientific information that you needed? Try to recall the steps, in sequence, that you took to obtain it.

_____
_____
_____
_____

45. If you had any difficulties in obtaining this information, what were they? _____

_____

_____

_____

46. Did you submit the research for journal publication? Yes___ No___.
Were they printed as a Biological Laboratories official report?
Yes___ No___ .
Was it recorded and classified as security information? Yes___ No___.
Did you have any copies of the scientific information circulated?
Yes___ No___.

47. Have you made any oral presentations of this scientific information?
Yes___ No___. If YES, where?

___A scientific society meeting
___A colloquium outside BioLabs
___A colloquium within BioLabs
___A briefing or conference within BioLabs
___A scientific committee
___Other (please specify)

If NO, would you have liked to make a presentation? Yes___ No___.

48. Have you received any comments (either written or oral) on this research? Yes___ No___. If YES, what form has this taken?

____Written inquiries about certain phases
____Requests for reprints
____Discussion by colleagues at meetings or conventions
____Discussion by colleagues at BioLabs
____Other (Please specify)

If NO, would you have liked comments? Yes___ No___.

49. Was there some scientific information that you now have that you would have liked to have earlier in this research? Yes___ No___.
If YES, was this scientific information available at that earlier date? Yes___ No___. How did you find out about it? _____

_____

_____

_____

_____

50. In the preceding questions, we have attempted to find channels by which you receive and transmit scientific information. Have we missed something you do in order to keep yourself adequately informed in your field and related fields?_____

51. Have you any ideas on how scientific information exchange could be improved? In these laboratories:_____

In your field:_____

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13 ABSTRACT

The status of scientific communications was evaluated at the U.S. Army Biological Laboratories through a questionnaire. Two hundred twenty-five responses provided the source information. Evidence indicates a hazy understanding of good communications, a lack of familiarity with the means of good communications, and a lack of recognition of the close interrelationships among information, management, and operations. Generally speaking, participants recognized these characteristics but questioned their own involvement in an information system rather than in their individual interests (operations). The implied placement of responsibility was on information personnel. Several suggestions are made in regard to the future course of Biological Laboratories' information systems.

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